

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-066269

(43) Date of publication of application : 10.03.1995

(51)Int.Cl.

H01L 21/68  
H01L 21/52  
H01L 21/301

(21)Application number : 05-214628

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(22)Date of filing : 31.08.1993

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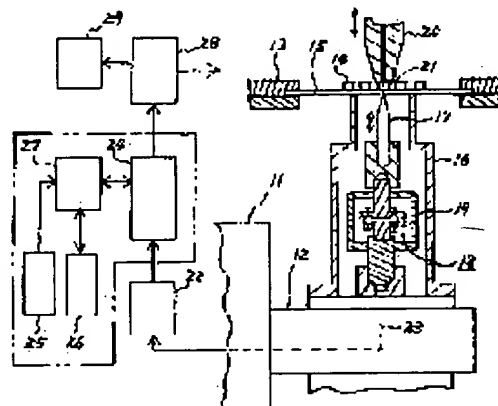
## (54) SEMICONDUCTOR MANUFACTURING DEVICE

(57)Abstract:

**PURPOSE:** To provide a semiconductor manufacturing equipment which can be easily set and kept optimal in operating condition and enhanced in product manufacturing yield and availability.

CONSTITUTION: When a semiconductor chip 14 is picked up from a wafer sheet by a collet 20, a load applied onto a needle 17 which pushes up the rear of the wafer sheet 15 is detected by a load cell 19 provided to a load sensing section 18, and the state of the semiconductor chip 14 is discriminated by a discriminating section 24 basing on the detection signal.

Therefore, an impact load corresponding to the state of the semiconductor chip 14 is detected by a load detecting section 18, the detection signal and a discriminating reference waveform previously set and stored in a memory 26 are compared with each other and discriminated through the discriminating section 24 to discriminate the state of the semiconductor chip 14. A semiconductor manufacturing equipment of this design can be made to cope with the state of a semiconductor chip basing on the discrimination result, so that it can be easily set and kept optimal in operating condition and enhanced in product manufacturing yield and availability.



## LEGAL STATUS

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 2818363

[Date of registration] 21.08.1998

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

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[Claim(s)]

[Claim 1] Semiconductor fabrication machines and equipment characterized by providing the following. The attaching part holding the wafer sheet with which two or more semiconductor devices were arranged on the front face. The aforementioned semiconductor device is thrust up and thrust up from the rear-face side of the aforementioned wafer sheet, and it is a member. The aforementioned semiconductor device thrust up by this pressure-from-below member is taken up and taken up from the front face of the aforementioned wafer sheet, and it is a member. The load detection section which detects the load which joins the aforementioned pressure-from-below member at the time of the pressure from below of the aforementioned semiconductor device, and the distinction section which distinguishes the state of the aforementioned semiconductor device based on the detection signal of this load detection section.

[Claim 2] Semiconductor fabrication machines and equipment according to claim 1 characterized by comparing the wave of the impact load which the impact load wave memorized beforehand and the load detection section detected, and distinguishing the state of a semiconductor device in the distinction section.

[Claim 3] Semiconductor fabrication machines and equipment according to claim 1 characterized by the distinction section comparing the quality criteria and the detection signal of the load detection section which were set up beforehand, distinguishing the quality of a semiconductor device, taking up the aforementioned semiconductor device judged to be good, and making it take up by the member.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the semiconductor fabrication machines and equipment which take up from on a wafer sheet the semiconductor device obtained by carrying out cutting separation of the semiconductor wafer.

[0002]

[Description of the Prior Art] Conventionally, after a division slot is \*\*\*\*(ed) by dicing equipment and a semiconductor wafer is divided into each semiconductor device by it, it is taken up one piece at a time from the wafer sheet front face which has adhesiveness by the pickup collet, is transported to a predetermined place, and is thrown into the following process.

[0003] Hereafter, the conventional example is explained with reference to drawing 5. Drawing 5 is drawing of longitudinal section of an important section, 1 is the move support mechanism prepared in the equipment base which is not illustrated in drawing, and 2 is the ejector section prepared in the move support mechanism 1. The move support mechanism 1 moves to X-axis-Y shaft orientations in the level surface which intersects perpendicularly with space, and the set-up position is made to stop the ejector section 2.

[0004] Moreover, 3 is the susceptor prepared in the equipment base, and supports the wafer sheet 5 with which the semiconductor device 4 was arranged on the front face. 6 is the tubed electrode holder formed in the ejector section 2, and is attracted and held by the source of suction which approaches the rear face of the wafer sheet 5 and does not illustrate the upper limit.

[0005] Furthermore, it thrusts up, and 7 is the needle which was attached in the ejector section 2 so that it might be arranged in a electrode holder 6 and might move in the vertical direction and which is a member, when this moves, it is the tip part of the metal or a diamond, and it operates so that the wafer sheet 5 may be thrust up from a rear-face side or pressure from below may be stopped. The semiconductor device 4 prepared in the point of the arm for a transfer which is not illustrated takes up 8, and the suction mouth 9 which is the metal collet which is a member and attracts a semiconductor device 4 at the nose of cam is carrying out opening.

[0006] Thus, in what was constituted, two or more semiconductor devices 4 which were able to be first carved from the semiconductor wafer fix to a susceptor 3 the wafer sheet 5 stuck on the front face by making a pasting side into the bottom. Then, the nose of cam of a needle 7 which the move support mechanism 1 was operated and was established in the ejector section 2 is located directly under the predetermined semiconductor device 4.

[0007] And the rear face of the wafer sheet 5 is approached in the upper limit of a electrode holder 6, and while operating the source of suction and attracting and holding the wafer sheet 5 around the predetermined semiconductor device 4, the rear face of the wafer sheet 5 of a part with which the nose of cam of a needle 7 is stuck on the same predetermined semiconductor device 4 is contacted. Moreover, it is made for a collet 8 to come to right above [ of the predetermined semiconductor device 4 to which the arm for a transfer is operated and the nose of cam of a needle 7 is located in directly under ], and

after contacting the upper surface of the predetermined semiconductor device 4 in the nose of cam of a collet 8, suction with the suction mouth 9 is performed.

[0008] Thus, the ejector section 2 is operated so that the semiconductor device 4 predetermined with a shell and a needle 7 may be thrust up from the rear face of the wafer sheet 5. Continuing suction with the suction mouth 9 simultaneously, by moving a collet 8 up, the predetermined semiconductor device 4 is stripped off from the front face of the wafer sheet 5, and is taken up in the state where it adsorbed at the nose of cam of a collet 8.

[0009] Furthermore, the position of the ejector section 2 is moved according to the move support mechanism 1, by changing the position of a collet 8 and repeating a series of above-mentioned operation by the arm for a transfer, it strips off from the wafer sheet 5 of a semiconductor device 4, and - \*\*\*\*\* is performed.

[0010] however, in the above-mentioned conventional technology, if it strips off from operation of pressure from below with the needle 7 of a semiconductor device 4, and the wafer sheet 5 by the collet 8 and - is not the proper thing with which operation to take up synchronized, it will be alike semiconductor device 4, a crack, a chip, a crack, etc. will occur, and a poor product will be produced That is, the semiconductor device 4 by the load of the collets 8, such as a shock at the time of a collet 8 contacting a semiconductor device 4 and vibration, and the collet 8 takes up, and the frequency of poor generating is greatly dependent on the gap of speed and timing etc. and -- although it became poor while the yield fell when a poor product was generated -- stripping off - and the operating ratio of equipment will fall [ by taking ]

[0011] For this reason, although the check of daily product quality and check of equipment are indispensable, and it is necessary to set the cam curve to the semiconductor device 4 of a collet 8 which makes small the shock in the case of contact, and vibration as much as possible, or opts for operation of a collet 8, a search speed, and the speed to take up as the optimal conditions so that poor generating may be reduced, a setup and maintenance of the optimal operating condition of this equipment are difficult.

[0012] Furthermore, in what the semiconductor device 4 consists of using the compound semiconductor of Ga system, since it is easy to damage, a setup and maintenance of the check of quality, check of equipment, and the optimal operating condition of equipment are very difficult.

[0013]

[Problem(s) to be Solved by the Invention] the proper thing's to which it took up from the wafer sheet and operation by the member which strip off and - take up synchronized with operation of the pressure from below by the pressure-from-below member of a semiconductor device conventionally as mentioned above -- \*\* -- the semiconductor device which it was difficult to carry out and to maintain proper, and the semiconductor device was damaged by the shock at the time of taking up etc., and became poor in reducing the yield of a product -- also taking up -- there was a possibility that it carries out carrying out etc. and an equipment operating ratio this invention was made in view of such a situation, a setup and maintenance of the optimal operating condition of equipment tend to do the place made into the purpose, and it is in offering the semiconductor fabrication machines and equipment whose yield and equipment operating ratio of a product improve.

[0014]

[Means for Solving the Problem] The attaching part holding the wafer sheet with which the semiconductor device of plurality [ semiconductor fabrication machines and equipment / of this invention ] was arranged on the front face, The semiconductor device thrust up by the pressure-from-below member which thrusts up a semiconductor device, and this pressure-from-below member is taken up from the front face of a wafer sheet, and is taken up from the rear-face side of a wafer sheet. A member, It is what is characterized by providing the load detection section which detects the load which thrusts up at the time of the pressure from below of a semiconductor device, and joins a member, and the distinction section which distinguishes the state of a semiconductor device based on the detection signal of this load detection section. further in the distinction section It is what is characterized by comparing the wave of the impact load which the impact load wave memorized beforehand and the load detection section detected, and distinguishing the state of a semiconductor device. further in the distinction section

It is characterized by comparing the quality criteria and the detection signal of the load detection section which were set up beforehand, distinguishing the quality of a semiconductor device, taking up the aforementioned semiconductor device judged to be good, and making it take up by the member.

[0015]

[Function] In case the semiconductor fabrication machines and equipment constituted as mentioned above take up a semiconductor device from on a wafer sheet, they detect the load which joins the pressure-from-below member thrust up from the rear-face side of a wafer sheet in the load detection section, and it is made to distinguish the state of a semiconductor device based on a detection signal. The impact load according to the state of the semiconductor device on the wafer sheet obtained when this thrusts up and the rear-face side of a wafer sheet is thrust up by the member is detected in the load detection section, and the state of a semiconductor device can be distinguished in the distinction section based on this detection signal. For this reason, it becomes that the yield of a product and whose operating ratio of equipment can perform correspondence according to the state of a semiconductor device, and becomes easy to do a setup and maintenance of the optimal operating condition of equipment, and improved by the distinction result.

[0016]

[Example] Hereafter, one example of this invention is explained with reference to drawing 1 or drawing 4. Drawing 1 is the block diagram of the outline shown by using an important section as drawing of longitudinal section, drawing 2 is the timing chart showing the movement of the perpendicular direction of a collet and a needle, drawing 3 is drawing for a semiconductor device taking up and explaining the collet in process, and the movement of a needle, and drawing 4 is the wave form chart of the load detection signal of the load detection section.

[0017] In drawing 1 or drawing 4, 11 is the move support mechanism prepared in the equipment base which is not illustrated, and 12 is the ejector section prepared in the move support mechanism 11. The move support mechanism 11 moves to X-axis-Y shaft orientations in the level surface which intersects perpendicularly with space, detects the positioning mark of an object etc. and makes a position stop the ejector section 12 by the mark detection section which is not illustrated.

[0018] Moreover, 13 is the susceptor prepared in the equipment base, and this susceptor 13 is horizontally supported by fixing the periphery section to the front face on which a semiconductor device 14 has adhesiveness for the wafer sheet 15 arranged and stuck. 16 is the electrode holder of the shape of a cylinder which has the path most prepared in the ejector section 12 by making shaft orientations perpendicular, and a path element, the upper limit of the path element establishes a small gap in the rear face of the wafer sheet 15, and opposite arrangement is carried out.

[0019] Furthermore, by the source of suction which the interior does not illustrate, a electrode holder 16 can come be considered as a reduced pressure state, attracts the wafer sheet 15 in the state of reduced pressure, and holds the upper limit of a electrode holder 16 in contact with the rear face of the wafer sheet 15. And by returning to an ordinary-pressure state, a small gap is again formed between the upper limit of a electrode holder 16, and the rear face of the wafer sheet 15, and maintenance of the wafer sheet 15 by the electrode holder 16 is canceled.

[0020] 17 thrusts up, mutual shaft orientations are made in agreement in the path element of a electrode holder 16, it is the needle which is a member and it is arranged [ this turns the tip part made from a metal or a diamond up, and ]. And the one end section of the load cell 19 of the load detection section 18 which operation shaft orientations were made in agreement in the path of a electrode holder 16 most, and was made and contained by cylindrical shaft orientations at it is connected to the soffit section of a needle 17.

[0021] Moreover, the other end of a load cell 19 is attached in the ejector section 12 so that the tip part of a needle 17 may move in the vertical direction. In addition, the timing of the movement of the perpendicular direction of a needle 17 is as the line N of operation at drawing 2, a needle 17 operates so that the wafer sheet 15 may be thrust up from a rear-face side when a tip part moves, or pressure from below may be stopped, and change of the load of shaft orientations which acts on a needle 17 according to this operation is outputted as a load detection signal from a load cell 19.

[0022] Furthermore, a semiconductor device 14 takes up 20, it is the metal collet which is a member and this is attached in the point of the arm for a transfer which was prepared in the equipment base and which is not illustrated. Moreover, it is possible to make a semiconductor device 14 adsorb at the nose of of cam of a collet 20, or to cancel adsorption by the suction mouth 21 for adsorbing a semiconductor device 14 carrying out opening at the nose of cam of a collet 20, and connecting this suction mouth 21 to the source of suction which is not illustrated, changing into a reduced pressure state or changing into an ordinary-pressure state.

[0023] In addition, the timing of the movement of the perpendicular direction of the collet 20 in the process which adsorbs a semiconductor device 14 and takes it up is a thing as the line M of operation shown in drawing 2. And the semiconductor device 14 by the collet 20 from the wafer sheet 15 takes, and raising is performed by the movement of a series of perpendicularly the needle 17 and the collet 20 worked together as shown in drawing 3.

[0024] On the other hand, 22 is the wave amplifier which pretreats amplification of the load detection signal outputted in the load detection section 18 of a load cell 19 etc., amplifies the signal inputted through the signal line 23, and outputs it to the distinction section 24 of the next step. Moreover, while the operation part 27 to which the setting section 25 and the memory section 26 were connected is connected to the distinction section 24, the output from the distinction section 24 is inputted into the control section 28 of equipment. In addition, 29 is the monitor section which is connected to a control section 28 and carries out the monitor of the output of the situation of operation and control situation of equipment, and the load detection section 18 etc., and a wave diagnostic meter is constituted by the distinction section 24, the setting section 25, the memory section 26, and operation part 27.

[0025] And the impact load wave in the various states in various kinds of semiconductor devices 14 is beforehand set up and memorized by the memory section 26 from the setting section 25. This setup performs setting operation first, before performing normal operation of equipment so that each state can be detected when a collet 20 is able to adsorb a semiconductor device 14 by the case where a semiconductor device 14 is a normal article, the crack, a chip, a crack, etc. when a product is faulty, and it is able to take up, or when not taken up.

[0026] It inputs into operation part 27 the impact load wave acquired from the needle 17 in each state by performing setting operation through the distinction section 24, and processes a distinction reference waveform by the setting section 25. As shown in drawing 4, processing is performed so that the upper limit wave Q and the minimum wave R may be acquired based on the reference waveform P at the time of the ability to adsorb the normal semiconductor device 14 and take it up, and it is performed in order to carry out generalizing the feature portion of the wave in each of other state etc. and to obtain a distinction reference waveform. The distinction reference waveform obtained by this processing is memorized by the memory section 26, and ends a setup.

[0027] And after a distinction reference waveform is set up, the normal operation of equipment is made to perform. The impact load of the needle 17 obtained from a load cell 19 at the time of this operation is inputted into the distinction section 24 as a load detection signal from the load detection section 18, comparison with the distinction reference waveform memorized by the impact load wave detected here and the memory section 26 is performed, and distinction of the state of a semiconductor device 14 is performed.

[0028] A distinction result will be controlled to stop suction with the suction mouth 21 of a collet 20 so that the semiconductor device 14 may not be adsorbed, if it is inputted into a control section 28, for example, a chip arises, it is in the state where a product is faulty and it will be distinguished. Then, operation of the move support mechanism 11, the ejector section 12, the arm for a transfer which has a collet 20 in a point further, etc., etc. is controlled that the following semiconductor device 14 should be adsorbed. In addition, about this control situation and situation of operation of a series of, and the impact load wave of the semiconductor device 14 of further each, a monitor is always carried out by the monitor 29.

[0029] thus, the semiconductor device 14 according to the collet 20 from the wafer sheet 15 at what is constituted -- taking up -- it is carried out as follows First, two or more semiconductor devices 14 which

were able to be carved into the susceptor 13 from the semiconductor wafer make the wafer sheet 15 stuck on the front face support. Subsequently, it is made for a needle 17 to be located in the rear face of the wafer sheet 15 of a part with which the predetermined semiconductor device 14 is stuck according to the move support mechanism 11 like the timing A of drawing 3, and is made for the suction mouth 21 of a collet 20 to be simultaneously located in right above [ of the same semiconductor device 14 ] by the arm for a transfer.

[0030] Then, like the timing B of drawing 3, operate the source of suction, decompress the inside of a electrode holder 16, a upper limit is made to attract the rear face of the wafer sheet 15, and it is made to hold. Moreover, the nose of cam of a collet 20 is made to approach the upper surface of a semiconductor device 14.

[0031] Next, the ejector section 12 is operated so that the semiconductor device 4 predetermined at the tip of a needle 17 may be thrust up from the rear face of the wafer sheet 15 at the time of the timing C of drawing 3. Making it make suction continue, the arm for a transfer is operated, and movement to the upper part of a collet 20 is synchronized with pressure-from-below operation of a needle 17, and is made to operate the source of suction, to start suction with the suction mouth 21 of a collet 20 simultaneously, and to start.

[0032] Furthermore, a collet 20 and a needle 17 are moved up at this speed, and the stroke of movement to the upper part of a collet 20 exceeds the stroke of the pressure from below of a needle 17 from the time of Timing C at the time of the timing D of drawing 3 after 20msec(s) - 30msec progress. And although movement to the upper part [ collet / 20 ] is continued between the times of the timing E of drawing 3, since a needle 17 does not change a position, both interval becomes large, and in the state where it adsorbed at the nose of cam of a collet 20, a semiconductor device 14 is stripped off from the front face of the wafer sheet 15, and is taken up after this.

[0033] It takes from the wafer sheet 15 of a semiconductor device 14 through such a process, and raising is performed, and load change which a needle 17 receives in this case is an impact load mainly applied to Timing D from Timing C, and is inputted into the distinction section 24 as a load detection signal of the load detection section 18 from a load cell 19. If this signal is the impact load wave which takes the value between the upper limit wave Q shown in drawing 4 memorized by the memory section 26, and the minimum wave R, comparison and distinction are performed in the distinction section 24, without there being neither a crack, nor a chip, a crack, etc., and making it generate, it strips from the wafer sheet 15 and \*\*\*\* is performed, it will be normal and it will be distinguished in the distinction section 24 that raising was carried out.

[0034] And if the semiconductor device 14 taken up in the predetermined place is transported and this transfer ends, a series of operation until the process which changes the place of a needle 17 or a collet 20 and the predetermined semiconductor device 14 takes up is started again, the semiconductor device 14 arranged on the wafer sheet 15 takes and raising is completed will be performed repeatedly.

Furthermore, when the impact load waves in pressure-from-below operation and a collet 20 with a needle 17 which the gap of a few arose to timing of operation by taking up, and were detected have differed a reference waveform P and a little, as an impact load wave becomes a thing near a reference waveform P, correction of a gap of the timing in a control section 28 is made.

[0035] moreover -- for example, it will be distinguished, if the pressure-from-below force of the beginning of a needle 17 might act greatly to Timing C and the semiconductor device 14 may have been damaged, when the impact load of the beginning in S points of drawing 4 was a thing exceeding the correspondence value in the upper limit wave Q, and this content of distinction outputs to a control section 28 from the distinction section 24 -- having -- immediately -- a collet 20 -- it takes up and operation is interrupted And operation which the following semiconductor device 14 takes up is begun.

[0036] moreover -- for example, -- when the impact load in T points of drawing 4 did not enter between the upper limit wave Q and the minimum wave R, to Timing D, the adhesive strength of the wafer sheet 15 is strong, and a semiconductor device 14 was not able to separate and take up that a collet 20 was not able to take up a semiconductor device 14 because of a suction force being weak etc. -- etc. -- generating of the situation is distinguished by the impact load wave



[0037] Since it is constituted as mentioned above, while a series of operation by the pressure from below and the collet 20 with a needle 17 of a semiconductor device 14 to take up compares the load detection signal which the load detection section 18 detects with the distinction reference waveform set up beforehand and the situation is supervised, it is controlled to become a wave in predetermined tolerance based on a comparison result. Therefore, it becomes the proper thing with which a series of operation synchronized, and generating of the crack in a semiconductor device 14, a chip, a crack, etc., etc. is suppressed, a poor product decreases and the poor yield improves.

[0038] moreover -- since operation by the collet 20 to take up was also performed by comparison with a load detection signal and a distinction reference waveform, it took except a normal thing and raising was not performed, although it became poor -- stripping off - it takes, and raising is not performed but the operating ratio of equipment improves

[0039] Furthermore, while correction of a gap of timing is made, in order to operate, it becomes unnecessary to carry out the check of product quality, check of equipment, etc. every day, and is easy to do a setup and maintenance of the optimal operating condition of equipment.

[0040] In addition, although comparison with the impact load wave based on the load detection signal detected in the above-mentioned example in the distinction reference waveform beforehand set up in the distinction section 24 and the load detection section 18 is performed and the state of a semiconductor device 14 is distinguished by the comparison result The range of the reference value in the time of predetermined plurality is set up beforehand, and these ranges are compared with the value of a load detection signal, the state of a semiconductor device 14 is distinguished, and it may be made to control equipment by the distinguished result by the control section. The distinction reference value which distinguishes a quality further beforehand is set up at the predetermined time C, for example, timing, and the distinction section compares the distinction reference value and load detection signal of a quality, and while judging as an excellent article what does not exceed a distinction reference value, you may control to take up only an excellent article by the collet 20 by the control section based on this result.

[0041] Moreover, although the load detection section 18 is constituted using a load cell 19, it is not limited to this, and it changes suitably within limits which do not deviate from a summary, and this invention can be carried out.

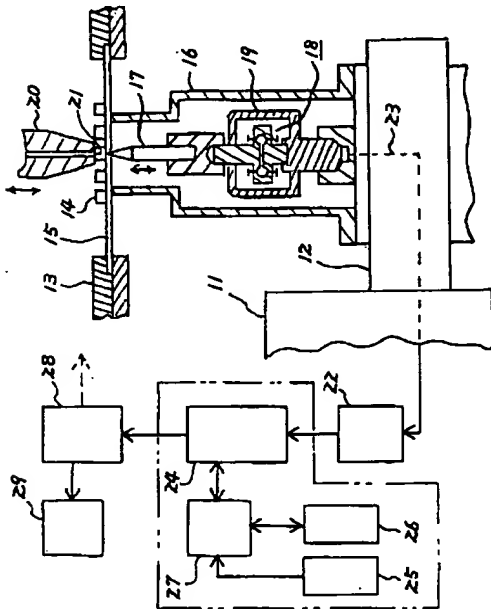
[0042]

[Effect of the Invention] Become easy doing a setup and maintenance of the optimal operating condition of equipment, and the effect of the yield of a product and the operating ratio of equipment improving does so by it having detected the load which joins the pressure-from-below member which thrusts up from the rear-face side of a wafer sheet in the load detection section, when this invention takes up a semiconductor device from on a wafer sheet, so that clearly from the above explanation, and having considered as the composition which distinguishes the state of a semiconductor device based on a detection signal.

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[Translation done.]

Drawing selection [Representative drawing] ▾



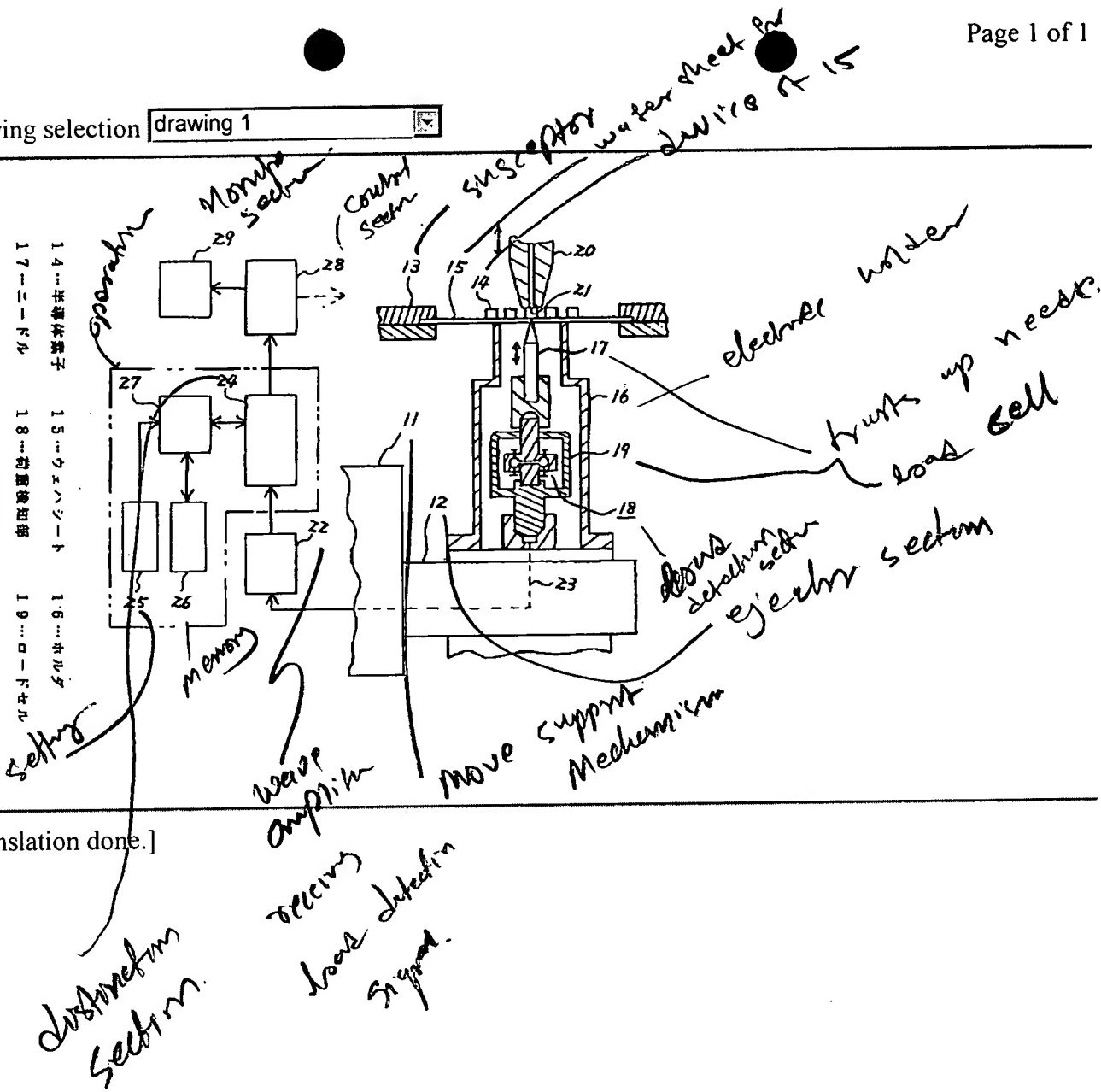
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| 26...メモリ部  |             |            |

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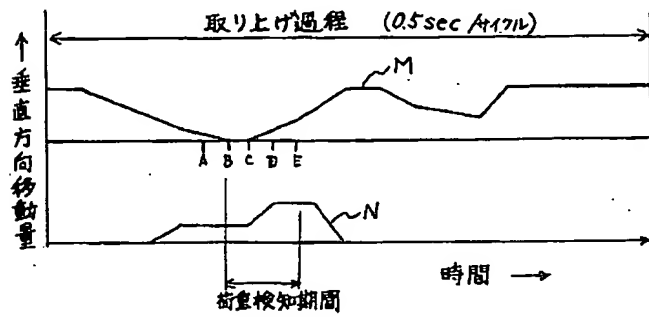
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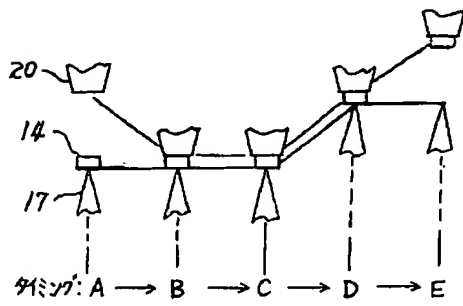
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- 16...ホルダ
- 19...ロードセル
- 24...荷重部



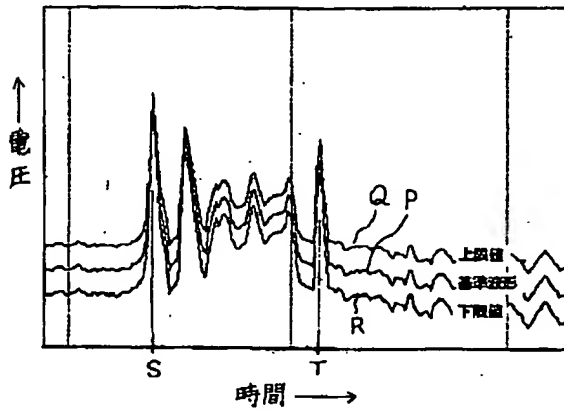
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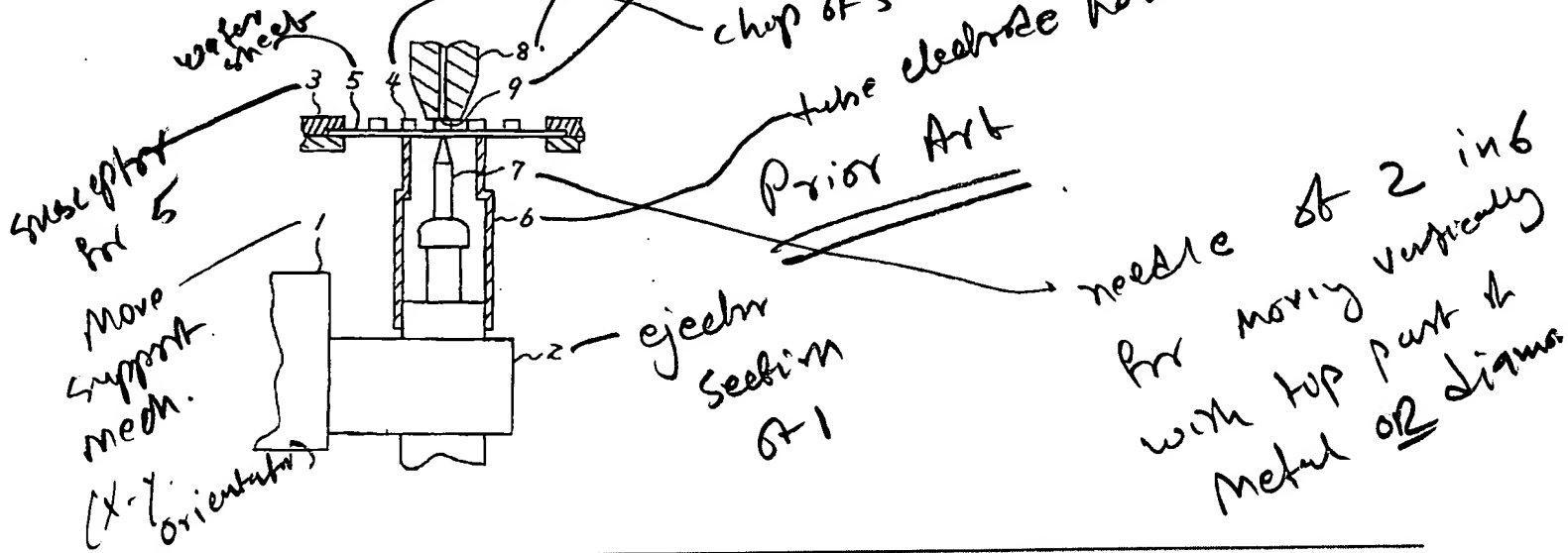
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